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A key to the peltigericolous fungi in Turkey

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Abstract — Eleven taxa of peltigericolous fungi are reported from Turkey for the first time – *Arthonia fuscopurpurea*, *A. peltigerina*, *Corticifraga fuckelii*, *C. peltigerae*, *Nectriopsis lecanodes*, *Norrlinia peltigericola*, *Polycoccum peltigerae*, *Scutula epiblastematica*, *Stigmidium leucophlebiae*, *Thelocarpon epibolum* var. *epithallinum,* and *Zwackhiomyces kiszkianus*. A key is provided to the 19 specific and infraspecific peltigericolous fungal taxa reported from Turkey. Also provided are additional references, a list of the distributions in Turkey, and a host index.

Key words — *Ascomycota*, lichenicolous fungi, *Peltigera*

Introduction

During our 2008–10 project, "Taxonomical research on *Peltigera* species distributed in western and eastern Black Sea region of Turkey and their lichenicolous fungi," we collected hundreds of *Peltigera* specimens and cited the distribution of *Peltigera* species in about two thirds of Turkey in our final project report (unpublished). The lichenized fungus genus *Peltigera* is a well-known exceptionally rich host for the obligately lichenicolous fungi known as "peltigericolous fungi" (Miądlikowska & Alstrup 1995, Candan et al. 2010). More than 80 species of peltigericolous fungi have been reported worldwide (Hawksworth 1980, Hawksworth & Miądlikowska 1997). Hawksworth (1980) cited the fact that *Peltigera* is one of the richest genera to harbor lichenicolous fungi as evidence that it is derived from a particularly ancient ascomycete group.

Only eight peltigericolous species (Halıcı 2008; Candan et al. 2010) have been included among the 166 lichenicolous fungal species reported from Turkey (Candan & Halıcı 2011, Halıcı & Candan 2011, Kocakaya et al. 2011). Our addition here of 11 peltigericolous taxa raises that total to 19 peltigericolous and 177 lichenicolous fungi now known from the country. We provide a key

to the known peltigericolous fungi with their distribution and host species in Turkey to encourage further study of the group in Turkey.

Material & methods

All materials (except *Refractohilum peltigerae*) of the 19 cited taxa were studied personally and are deposited in ANES (Eskişehir, Turkey). Specimens were examined with a Leica DM 1000 research microscope. Hand sections were examined in K (10% KOH solution), I (Merck Lugol's iodine), and water. Ascospore measurements were made in water. Under 'Taxonomy' we provide as much information as possible from the Turkish specimens studied for taxa new to Turkey and refer to more detailed descriptions for all taxa. A map showing the geographical provinces of Turkey (Fig. 1) and provincial vehicle registration codes (Table 1) summarize the distribution of the taxa in Turkey. A host index (Table 2) is also provided.

Taxonomy

Arthonia fuscopurpurea (Tul.) R. Sant.

A detailed description is provided by Santesson (1960).

The Turkish specimen, collected on a thallus of *Peltigera polydactylon,* seems weakly parasitic, causing bleaching of infected parts of the host thallus. Ascomata arthonioid, sometimes grouped together. Hymenium hyaline, K/I+ blue, I+ red. Epihymenium greenish brown. Asci 8-spored, ascospores hyaline, 1-septate, 9–11 × 3–4 µm. Distribution in Turkey: 29.

Material examined: **TURKEY. Gümüşhane**, Torul, southern slopes of Zigana Mountain, 40°38′28″N 39°23′50″E, alt. 2100 m, on *Peltigera polydactylon*, 04.09.2009, M. Candan, M.G. Halıcı & O. Sezer (ANES 14199).

Arthonia peltigerina (Almq.) H. Olivier

A detailed description is provided by Almquist (1880).

Turkish specimens, collected on thalli of *Peltigera canina* and *P. praetextata,* seem parasitic, bleaching the infected parts of the host thalli. Infection is generally seen in the old parts of the host thalli. Ascomata arthonioid, < 0.5 mm diam., often grouped together in subconcentric rings, sometimes grouped together. Hymenium hyaline, K/I+ blue, I+ red, dextrinoid. Epihymenium brown, slightly greenish tones available, I+ reddish brown. Asci 8-spored, I+ yellowish orange. Ascospores hyaline, 1-septate, cells with oil droplets, with a gelatinous sheath, 14–17 × 5–7 µm. Distribution in Turkey: 03.

Material examined: **TURKEY. Afyon,** Sultandağı, Sultandağı Mountains, 38°28′35″N 31°10′48″E, alt. 1622 m, in *Quercus vulcanica* forest, on *Peltigera canina*, 11.05.2010, M. Candan (ANES 13824); 38°28′48″N 31°11′12″E, alt. 1692 m, in *Quercus vulcanica* forest, on *Peltigera praetextata* on mosses, 11.05.2010, M. Candan (ANES 13836).

Capronia peltigerae (Fuckel) D.Hawksw.

Detailed descriptions of the species are provided by Hawksworth (1980) and Zhurbenko (2004) and of the Turkish specimens by Candan & al. (2010).

Specimens were collected on thalli of *Peltigera canina*, *P. leucophlebia*, *P. monticola* and *P. neckeri.* Distribution in Turkey: 03, 09, 26, 29, 35, 37, 48.

Material examined: **TURKEY. Aydın**, Nazilli, north of Kavaklıdere, 37°27′39″N 28°20′39″E, alt. 800 m, in *Pinus brutia* forest, on *Peltigera neckeri*, 15.06.2009, M. Candan & O. Sezer (ANES 14220); **Eskişehir**, İnönü, south of Erenköy Village, 39°44′N 30°01′E, alt. 1100 m, in *Quercus* sp. communities and *Pinus nigra* forest, on *Peltigera monticola*, 02.05.2010, M. Candan (ANES 14216); **Gümüşhane,** Torul, exit of Torul, southern slopes of Zigana pass, 40°38′04″N 39°23′12″E, alt. 1019 m, in *Picea* and *Abies* forest, on *Peltigera canina*, 04.09.2009, M. Candan & M.G. Halıcı (ANES 14217); **İzmir,** Kemalpaşa, Nif Mountain, 38°24′04″N 27°23′52″E, alt. 869 m, in *Pinus nigra* forest, on *Peltigera neckeri*, 16.06.2009, M. Candan & O. Sezer (ANES 14218); **Kastamonu,** Şenpazar, southwest of Sada Village, Küre Mountains, 41°43′45″N 33°29′04″E, alt. 830 m, in *Abies nordmanniana* and *Pinus sylvestris* mixed forest, on *Peltigera leucophlebia*, 30.07.2010, M. Candan & M.G. Halıcı (ANES 14219).

Corticifraga fuckelii (Rehm) D. Hawksw. & R. Sant.

A detailed description is provided by Hawksworth & Santesson (1990).

The Turkish specimen, collected on thalli of *Peltigera* sp. (with gyrophoric acid determined by TLC), seems parasymbiotic (no visible damage to the host thallus). Ascomata apothecia, 0.2–0.3 mm diam., not arising in circular spots of the host thallus. Interascal filaments with a hyaline end cell, 1.5–2 µm diam. Hymenium 50–60 µm tall. Asci 8-spored, I+ red. Ascospores hyaline, 1–2-septate, 15–18 × 5–7 µm. Distribution in Turkey: 08.

Material examined: **TURKEY. Artvin,** Şavşat, northeast of Şavşat, 41°13′67″N 42°22′58″E, alt. 1360 m, in *Picea orientalis* forest, on *Peltigera* sp. (with gyrophoric acid) on mosses, 31.08.2009, M. Candan, M.G. Halıcı & Okan Sezer (ANES 13825).

Corticifraga peltigerae (Fuckel) D. Hawksw. & R. Sant.

A detailed description is provided by Hawksworth & Santesson (1990).

The Turkish specimens, collected on thalli of *Peltigera canina*, *P. monticola* and *P. rufescens,* seem parasitic (bleaching seen in the infected parts of the host thalli). Ascomata apothecia, 0.2–0.3 mm diam., arising in circular spots of the host thallus. Interascal filaments with a brown end cell (not a good taxonomical character, in our opinion, as this is indistinct in sections from young ascomata). Hymenium 50–60 µm tall. Asci 8-spored. Ascospores hyaline, 1–3-septate, 12–20 × 5–7 µm. Distribution in Turkey: 08, 42, 45, 66.

Material examined: **TURKEY. Artvin**, Şavşat, northeast of Şavşat, 41°13′67″N 42°22′58″E, alt. 1360 m, in *Picea orientalis* forest, on *Peltigera rufescens*, 31.08.2009, M. Candan, M.G. Halıcı & O. Sezer (ANES 13830); Ardanuç, 41°13′52″N 42°05′31″E, alt. 472 m, in *Alnus-Quercus* forest, on *Peltigera canina*, 31.08.2009; M. Candan, M.G. Halıcı & O. Sezer (ANES14221); **Manisa,** Akhisar, Sındırgı road, east of İsaca Village, 39°09′35″N 28°01′29″E, alt. 490 m, in *Pinus brutia* forest, on *Peltigera monticola* , 17.06.2009; M. Candan & O. Sezer (ANES 13829); **Konya**, Bozkır-Belören, west of Aydınkışla Village, 37°13′21″N 32°21′27″E, alt. 1400 m, in *Juniperus* sp. communities, on *Peltigera monticola*, 05.08.2009, M. Candan & M.G. Halıcı (ANES 13826); **Yozgat**, 10 km to Yozgat, 39°37′13″N 34°56′53″E, alt. 1015 m, on *Peltigera rufescens*, 25.08.2009. M. Candan, M.G. Halıcı & O. Sezer (ANES 13828).

Dacampia rufescentis (Vouaux) D. Hawksw.

Detailed descriptions of the species are provided by Vouaux (1912) and Hawksworth (1986) and of the Turkish specimen by Candan & al. (2010).

Specimens were collected on thalli of *Peltigera kristinssonii*, *P. ponojensis*, *P. praetextata,* and *P. rufescens*. Distribution in Turkey: 26, 32, 37, 66.

Material examined: **TURKEY. Isparta**, Eğirdir, east of Mahmatlar Village, northern slopes of Eğirdir Lake, 37°57′11″N 30°56′41″E, alt. 940 m, in siliceous rocks, on *Peltigera kristinssonii*, 31.07.2009, M. Candan & M.G. Halıcı (ANES 14213). **Kastamonu,** Seydiler, southeast of Seydiler, Kastamonu highway, Oyrak passage, 41°34′26″N 33°46′43″E, alt. 1200 m, in *Salix* sp., *Populus* sp., and open areas, on *Peltigera rufescens*, 30.07.2010, M. Candan & M.G. Halıcı (ANES 14214); **Yozgat,** Çayıralan, Çat forests, 39°19′30″N 35°50′17″E, alt. 1650 m, in *Pinus sylvestris* forest, on *Peltigera ponojensis*, 27.08.2009, M. Candan, M.G. Halıcı & O. Sezer (ANES 14215).

Nectriopsis lecanodes (Ces.) Diederich & Schroers

Detailed descriptions are provided by Booth (1959) and Sérusiaux et al. (1999).

Turkish specimens, collected on thalli of *Peltigera leucophlebia,* seem parasitic (extensive damage seen in the infected parts of the host thalli). Ascomata perithecioid, 150–300 µm diam., pinkish to orange, often covered with a whitish tomentum, arising on a small stalk. Hymenium orange. Asci 8-spored. Ascospores oblique, uniseriately arranged in the asci, hyaline, 1-septate, one or two oil droplets present in each cell, ellipsoid, round in the apices, more or less verruculose, 10–12 × 4–5 µm. Distribution in Turkey: 25, 37.

Material examined: **TURKEY. Erzurum,** Olur, southeast of Yukarıkaracasu Village, 40°49′26″N 42°17′11″E, alt. 1800 m, in *Pinus sylvestris* forest, on *Peltigera leucophlebia* on mosses, 30.08.2009, M. Candan, M.G. Halıcı & O. Sezer (ANES 14203); **Kastamonu,** Azdavay, southwest of Sada Village, Küre Mountains, 41°43′45″N 33°29′04″E, alt. 830 m, in *Abies nordmanniana* and *Pinus sylvestris* forest, on *Peltigera leucophlebia* on mosses, 30.07.2010, M. Candan & M.G. Halıcı (ANES 13837).

Neolamya peltigerae (Mont.) Theiss. & Syd.

Detailed descriptions of the species are provided by Keissler (1930) and Ertz et al. (2004) and of the Turkish specimen by Candan & al. (2010).

Specimens were collected on thalli of *Peltigera didactyla*. Distribution in Turkey: 08, 55.

Material examined: **TURKEY. Samsun**, Ayvacık, northwest of Hasan Uğurlu Dam Lake, 40°56′33″N 36°38′21″E, alt. 80 m, in siliceous rocks, on *Peltigera didactyla*, 07.09.2009, M. Candan, M.G. Halıcı & O. Sezer (ANES 14202).

Norrlinia peltigericola (Nyl.) Theiss. & Syd.

Detailed descriptions are provided by Hawksworth (1980) and Martinez & Hafellner (1998).

The Turkish specimen, collected on a *Peltigera praetextata* thallus, seems parasymbiotic (no visible damage to the host lichen). Ascomata perithecioid,

black, aggregated in small groups, immersed only at the base, wall blackish in the outer part, brown in the inner part. Interascal filaments not present, oil droplets present. Asci 2-spored. Ascospores hyaline, rarely very pale brownish, muriform with 12 transsepta and 4 longisepta, 42–52 × 14–28 µm. Distribution in Turkey: 09.

Material examined: **TURKEY. Aydın,** Bozdağan, Madran Mountain, south of Altıntaş Village, 37°35′40″N 28°21′00″E, alt. 800 m, in *Pinus brutia* forest, on *Peltigera praetextata*, 15.06.2009, M. Candan & O. Sezer (ANES 13833).

Phoma peltigerae (P. Karst.) D. Hawksw.

Detailed descriptions of the species are provided by Keissler (1930) and Hawksworth (1981) and of the Turkish specimens by Candan & al. (2010).

Specimens were collected on thalli of *Peltigera canina*, *P. elisabethae,* and *P. rufescens.* Distribution in Turkey: 11, 16, 43.

Polycoccum crassum Vězda

A detailed description of the species is provided by Hawksworth & Diederich (1988) and of the Turkish specimens by Halıcı et al. (2007) and Candan & al. (2010).

Specimens were collected on thalli of *Peltigera canina*, *P. elisabethae*, *P. monticola,* and *P. neckeri.* Distribution in Turkey: 08, 29, 35, 44, 48, 66.

Material examined: **TURKEY. Artvin,** Şavşat, northeast of Şavşat, 41°13′67″N 42°22′58″E, alt. 1360 m, in *Picea orientalis* forest, on *Peltigera elisabethae*, 31.08.2009, M. Candan, M.G. Halıcı & O. Sezer (ANES 14206); **Gümüşhane,** Torul, exit of Torul, southern slopes of Zigana pass, 40°38′04″N 39°23′12″E, alt. 1019 m, in *Picea* and *Abies* forest, on *Peltigera neckeri*, 04.09.2009, M. Candan, M.G. Halıcı & O. Sezer (ANES 14207); **İzmir,** Kemalpaşa, Nif Mountain, 38°24′50″N 27°23′40″E, alt. 710 m, in *Pinus brutia* forest, on *Peltigera neckeri,* 16.06.2009, M. Candan & O. Sezer (ANES 14208); **Yozgat**, Çayıralan, Çat forest enterance, Sivas province border, 39°19′30″N 35°50′17″E, alt. 1650 m, in *Pinus sylvestris* forest, on *Peltigera monticola*, 27.08.2009, M. Candan, M. G. Halıcı & O. Sezer (ANES 14209).

Polycoccum peltigerae (Fuckel) Vězda

A detailed description is provided by Hawksworth & Diederich (1988).

Turkish specimens, collected on thalli of *Peltigera leucophlebia* and *P. rufescens,* seem slightly parasitic (swellings seen on the host lichens; heavy infections may kill parts of the host thallus). Ascomata perithecioid, ~ 200 µm diam., entirely immersed in the host lichens, becoming erumpent only in the ostiolar region. Asci 8-spored. Ascospores brown, 1-septate, ellipsoid to fusiform, cells generally attenuated at the ends, 14–18 × 5–6 µm. Distribution in Turkey: 08, 37.

Material examined: **TURKEY. Artvin,** Şavşat, northeast of Şavşat, 41°13′67″N 42°22′58″E, alt. 1360 m, in *Picea orientalis* forest, on *Peltigera rufescens*, 31.08.2009, M. Candan, M. G. Halıcı & O. Sezer (ANES 14204); **Kastamonu,** near Azdavay, southwest of Sada Village, Küre Mountains, alt. 830 m, in *Abies nordmanniana* and *Pinus sylvestris* forest, on *Peltigera leucophlebia* , 30.07.2010. M. Candan & M.G. Halıcı (ANES 14205).

Pronectria robergei (Mont. & Desm.) Lowen

A detailed description of the species is provided by Keissler (1930) and of the Turkish specimen by Candan & al. (2010).

The specimen was collected on thallus of *Peltigera rufescens.* Distribution in Turkey: 08.

Refractohilum peltigerae (Keissl.) D. Hawksw.

Detailed descriptions of the species are provided by Hawksworth (1977, 1979) and of the Turkish specimen by John & Breuss (2004) and Halıcı (2008).

The specimen was collected on thallus of *Peltigera polydactylon.* Distribution in Turkey: 61.

Scutula epiblastematica (Wallr.) Rehm

Detailed descriptions are provided by Triebel et al. (1997) and Clauzade et al. (1989).

The Turkish specimen, collected on thallus of *Peltigera praetextata,* seems parasitic (host algal photobiont depleted in the infected parts of the thallus). Ascomata apothecioid, often aggregated, cream coloured when young, becoming greenish black when mature. Inner part of exciple purplish brown Hymenium hyaline, I+ red, hypothecium pale brownish. Asci *Scutula*-type (with a fuzzy K/I+ blue tube-like structure in the tholus). Ascospores hyaline, 1-septate, with oil droplets, 8–11 × 3–4 µm. Distribution in Turkey: 67.

Material examined: **TURKEY. Zonguldak,** Devrek, north of İsabeyli Village, Babadağ Mountain, 41°13′23″N 31°52′57″E, alt. 600 m, in *Carpinus* sp. and *Fagus orientalis* forest, on *Peltigera praetextata* on mosses, 29.07.2010, M. Candan & M.G. Halıcı (ANES 14198).

Stigmidium leucophlebiae Cl. Roux & Triebel

A detailed description is provided by Roux & Triebel (1994).

Turkish specimens, collected on thalli of *Peltigera leucophlebia,* seem parasitic (infected host thallus parts brownish or blackish). Ascomata perithecioid, 50–60 µm diam., semi-immersed. Vegetative hyphae sometimes visible on the host thalli. Asci 8-spored. Ascospores hyaline, 1-septate, cells not equal in size, with a gelatinous sheath, 9–14 × 4–5 µm. Distribution in Turkey: 37, 78.

Material examined: **TURKEY. Karabük,** Yenice, Şeker canyon, 41°11′26″N 32°21′35″E, alt. 230 m, in mixed *Pinus nigra* and broad leaved tree forest, on *Peltigera leucophlebia*, 01.06.2009, A. Türk & M. Candan (ANES 13834); **Kastamonu**, Şenpazar, southwest of Sada Village, Küre Mountains, 41°43′45″N 33°29′04″E, alt. 830 m, in *Abies nordmanniana* and *Pinus sylvestris* mixed forest, on *Peltigera leucophlebia*, 30.07.2010, M. Candan & M. G. Halıcı (ANES 13835).

Stigmidium peltideae (Vain.) R.Sant.

A detailed description of the species is provided by Roux & Triebel (1994) and of the Turkish specimens by Candan & al. (2010).

Specimens were collected on thalli of *Peltigera collina*, *P. neckeri,* and *P. praetextata.* Distribution in Turkey: 03, 09, 26, 29, 48, 66.

Material examined: **TURKEY. Aydın**, Nazilli, Semailli Village road, 38°01′12″N 28°18′24″E, alt. 850 m, in *Quercus* forest and siliceous rocks, on *Peltigera neckeri*, 15.06.2009, M. Candan & O. Sezer (ANES 14210); **Eskişehir**, Türkmen Dağı, Gölcük road, 39°29′N 30°21′E, alt. 1320 m, in siliceous rocks, on *Peltigera collina*, 24.03.2009, M. Candan (ANES 14211); **Gümüşhane,** Torul, exit of Torul, southern slopes of Zigana pass, 40°38′04″N 39°23′12″E, alt. 1019 m, in *Picea* and *Abies* forest, on *Peltigera neckeri*, 04.09.2009, M. Candan, M.G. Halıcı & O. Sezer (ANES 14212); **Muğla**, Yatağan, Yatağan old road, Gökbel pass, 37°25′34″N 28°08′52″E, alt. 323 m, on *Peltigera neckeri*, 15.06.2009, M. Candan & O. Sezer (ANES 14222); **Yozgat**, Akdağmadeni, east of Akdağmadeni, 39°40′00″N 35°56′07″E, alt. 1603 m, in *Pinus sylvestris* forest, on *Peltigera neckeri*, 26.08.2009, M. Candan, M.G. Halıcı & O. Sezer (ANES 14223).

Thelocarpon epibolum* var. *epithallinum (Leight. ex Nyl.) G. Salisb.

Detailed descriptions are provided by Salisbury (1966) and Ahti (1973).

The Turkish specimen, collected on a *Peltigera leucophlebia* thallus, seems parasymbiotic (no visible damage to the host lichen seen). Ascomata perithecioid, superficial, bright yellow, citrine green when fresh, pruinose, 150–250 µm diam. Interascal filaments present, hyaline, oil droplets present. Asci more than 50-spored. Ascospores hyaline, simple, 9–11 × 3–4 µm. Distribution in Turkey: 78.

Material examined: **TURKEY. Karabük,** Şeker, Yenice, Şeker canyon, 41°11′26″N 32°21′35″E, alt. 230 m, in mixed *Pinus nigra* and broad leaved tree forest, on *Peltigera leucophlebia*, 01.06.2009, A. Türk & M. Candan (ANES 13831).

Zwackhiomyces kiszkianus D. Hawksw. & Miądl.

A detailed description is provided by Hawksworth & Miądlikowska (1997).

The Turkish specimen, collected on a *Peltigera elisabethae* thallus, seems parasymbiotic (no visible damage to the host lichen seen). Ascomata perithecioid, scattered, immersed, exposed only at the ostiole. Asci (6–)8-spored. Ascospores hyaline, ellipsoid to somewhat soleiform, 1-septate, constricted at the septum, 25–27 × 11–12 µm. Distribution in Turkey: 08.

Material examined: **TURKEY. Artvin,** Şavşat, northeast of Şavşat, 41°13′67″N 42°22′58″E, alt. 1360 m, in *Picea orientalis* forest, on *Peltigera elisabethae*, 31.08.2009, M. Candan, M.G. Halıcı & O. Sezer (ANES 14201).

Key to the peltigericolous fungi species in Turkey

1. Spores produced in asci **2**
1. Spores not produced in asci **18**
2(1). Ascomata perithecioid **3**
2. Ascomata arthonioid or apothecioid **14**
3(2). Ascospores brown when mature **4**
3. Ascomata hyaline or rarely very pale brown when mature **7**

4(3). Ascospores 1-septate **5**
4. Ascospores 3-septate or muriform with trans- and longisepta **6**

5(3). Perithecia 300–500 µm diam., in general on the lower surface of the host lichen. Asci 4-spored. Ascospores 24–30 × 8–10 µm ..... ***Polycoccum crassum***
5. Perithecia ~ 200 µm diam., entirely immersed in the host lichen, becoming erumpent only in the ostiolar region. Asci 8-spored. Ascospores 14–18 × 5–6 µm ..... ***Polycoccum peltigerae***

6(4). Perithecia covered with stiff, smooth-walled, and dark brown hairs ..... ***Capronia peltigerae***
6. Perithecia without hairs. ..... ***Dacampia rufescentis***

7(3). Asci containing more than 8 spores **8**
7. Asci up to 8-spored. **9**

8(5). Perithecia immersed to slightly erumpent, black. Asci 16-spored ..... ***Neolamya peltigerae***
8. Perithecia superficial, bright yellow, citrine green when fresh, pruinose. Asci more than 50-spored ..... ***Thelocarpon epibolum* var. *epithallinum***

9(7). Asci 8-spored **10**
9. Asci 2-spored. ..... ***Norrlinia peltigericola***

10(9). Perithecia in pink, orange or reddish tones **11**
10. Perithecia black **12**

11(10). Perithecia pinkish to orange, often covered with a whitish tomentum, arising on a small stalk ..... ***Nectriopsis lecanodes***
11. Perithecia orange-red, becoming yellowish when old; immersed to semi-immersed ..... ***Pronectria robergei***

12(10). Interascal filaments absent **13**
12. Interascal filaments present ..... ***Zwackhiomyces kiszkianus***

13(12). Perithecia 50–60 µm diam. Ascospores 9–14 × 4–5 µm ..... ***Stigmidium leucophlebiae***
13. Perithecia 35–40 µm diam. Ascospores 11–12 × 2.5–3 µm ..... ***Stigmidium peltideae***

14(2). Ascomata apothecioid **15**
14. Ascomata arthonioid **17**

15(14). Asci not *Scutula*-type **15**
15. Asci *Scutula*-type. ..... ***Scutula epiblastematica***

16(15). Ascomata not arising in circular spots of the host thallus, not bleaching the thallus. Interascal filaments with a hyaline end cell, 1.5–2 µm diam ..... ***Corticifraga fuckelii***
16. Ascomata arising in circular bleached spots of the host thallus. Interascal filaments with a brown end cell ..... ***Corticifraga peltigerae***

17(14). Ascomata often grouped together in subconcentric rings. Ascospores 14–17 × 5–7 µm ..... ***Arthonia peltigerina***

17. Ascomata sometimes grouped together. Ascospores 9–11 × 3–4 µm ..... ***Arthonia fuscopurpurea***

18(1). Conidia produced within pycnidia (coelomycetes). ..... ***Phoma peltigerae***

18. Conidia not produced within pycnidia (hyphomycetes) ..... ***Refractohilum peltigerae***

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Table 1. Provincial vehicle registration codes.

Code	Province	Code	Province
01	Adana	42	Konya
02	Adıyaman	43	Kütahya
03	Afyon	44	Malatya
04	Ağrı	45	Manisa
05	Amasya	46	Kahramanmaraş
06	Ankara	47	Mardin
07	Antalya	48	Muğla
08	Artvin	49	Muş
09	Aydın	50	Nevşehir
10	Balıkesir	51	Niğde
11	Bilecik	52	Ordu
12	Bingöl	53	Rize
13	Bitlis	54	Sakarya
14	Bolu	55	Samsun
15	Burdur	56	Siirt
16	Bursa	57	Sinop
17	Çanakkale	58	Sivas
18	Çankırı	59	Tekirdağ
19	Çorum	60	Tokat
20	Denizli	61	Trabzon
21	Diyarbakır	62	Tunceli
22	Edirne	63	Şanlıurfa
23	Elazığ	64	Uşak
24	Erzincan	65	Van
25	Erzurum	66	Yozgat
26	Eskişehir	67	Zonguldak
27	Gaziantep	68	Aksaray
28	Giresun	69	Bayburt
29	Gümüşhane	70	Karaman
30	Hakkari	71	Kırıkkale
31	Hatay	72	Batman
32	Isparta	73	Şırnak
33	İçel	74	Bartın
34	İstanbul	75	Ardahan
35	İzmir	76	Iğdır
36	Kars	77	Yalova
37	Kastamonu	78	Karabük
38	Kayseri	79	Kilis
39	Kırklareli	80	Osmaniye
40	Kırşehir	81	Düzce
41	Kocaeli		

Table 2. Host index.

HOST LICHEN	LICHENICOLOUS FUNGUS
Peltigera canina	*Arthonia peltigerina*
	Capronia peltigerae
	Corticifraga peltigerae
	Phoma peltigerae
	Polycoccum crassum
Peltigera collina	*Stigmidium peltideae*
Peltigera didactyla	*Neolamya peltigerae*
Peltigera elisabethae	*Phoma peltigerae*
	Polycoccum crassum
	Zwackhiomyces kiszkianus
Peltigera kristinssonii	*Dacampia rufescentis*
Peltigera leucophlebia	*Capronia peltigerae*
	Nectriopsis lecanodes
	Polycoccum peltigerae
	Stigmidium leucophlebiae
	Thelocarpon epibolum var. *epithallinum*
Peltigera monticola	*Capronia peltigerae*
	Corticifraga peltigerae
	Polycoccum crassum
Peltigera neckeri	*Capronia peltigerae*
	Polycoccum crassum
	Stigmidium peltideae
Peltigera polydactylon	*Arthonia fuscopurpurea*
	Refractohilum peltigerae
Peltigera ponojensis	*Dacampia rufescentis*
Peltigera praetextata	*Arthonia peltigerina*
	Dacampia rufescentis
	Norrlinia peltigericola
	Scutula epiblastematica
	Stigmidium peltideae
Peltigera rufescens	*Corticifraga peltigerae*
	Dacampia rufescentis
	Phoma peltigerae
	Polycoccum peltigerae
	Pronectria robergei
Peltigera sp. (with gyrophoric acid)	*Corticifraga fuckelii*

Fig. 1. Turkish provinces and their vehicle registration codes.